

Summary of Results of Charbert Hydrogen Sulfide Monitoring  
July 26 – August 3, 2004  
And Volatile Organic Compound Sample from July 30, 2004

The Rhode Island Department of Environmental Management (RI DEM) is currently operating a continuous hydrogen sulfide monitor at 16 River Street in Alton, which is north of the lagoons at the Charbert facility. The monitors at that location ran continuously during the period of July 26 through August 3, 2004. In addition, an air sample was collected on River Street on July 30, 2004 and analyzed for volatile organic compounds (VOCs).

Hydrogen sulfide levels were elevated between 9:54 and 11:08 PM on Monday, July 26<sup>th</sup> and again between 1:24 and 3:28 AM on Tuesday, July 27<sup>th</sup>. The maximum concentration during that period, 26 ppb, was recorded at 2:39 AM on the 27<sup>th</sup> and the maximum one-hour average concentration was 23 ppb.

At approximately 7:50 AM on Tuesday, July 27<sup>th</sup>, Charbert began operation of aerators in its active lagoon, Lagoon 1, in an attempt to reduce anaerobic degradation and thus reduce hydrogen sulfide formation. In the subsequent seven-day period, elevated hydrogen sulfide levels were recorded during only one period. Hydrogen sulfide levels reached 10 ppb at 11:54 PM on Thursday, July 29<sup>th</sup> and were above 10 ppb sporadically from 5:59 to 8:28 AM on July 30<sup>th</sup>. The maximum concentration during that period was 29 ppb, recorded at 7:59 AM on the 30<sup>th</sup> and the maximum one-hour average concentration was 23 ppb.

No hydrogen sulfide concentrations above 2 ppb were recorded during the remainder of the sampling period, from 9:30 AM on Friday, July 30<sup>th</sup> through 11:00 AM on Tuesday, August 3<sup>rd</sup>. This is the longest period without elevated levels since hydrogen sulfide monitoring was initiated at this site on June 7<sup>th</sup>. Calm wind conditions occurred on one night and southerly winds occurred frequently during that period; those conditions have frequently been associated with elevated hydrogen sulfide concentrations in the neighborhood.

Residents reported a strong odor of burning oil throughout the neighborhood on July 29<sup>th</sup> and 30<sup>th</sup>. A representative of RI DEM observed an odor described as a decomposition odor near the aerated lagoon and in the neighborhood on July 30<sup>th</sup>. A sample was taken in an evacuated canister from 1:30 – 2:00 PM on that day on River Street and was analyzed for volatile organic compounds (VOC) at the RI Department of Health Air Pollution laboratory. During that period, winds were from the south, the direction of the lagoons.

The results of the VOC sample and of VOC samples taken in June 2004 are attached as Appendix A. Concentrations of the target VOCs in the July 30<sup>th</sup> sample were generally lower than those in the earlier samples and consistent with background levels of VOCs in non-urban areas of the State. Note that the earlier samples were taken in the early morning hours when stagnant wind conditions were present while a light wind was present during the more recent sampling period. The laboratory did, however, identify low levels of three aldehyde compounds; butanal, pentanal and hexanal; in the July sample. These substances are not part of the target list of substances measured by this sampling method and the concentrations of those substances were not quantified. Aldehydes are produced by a variety of processes, including combustion and decomposition of organic material. Although these substances are irritants at very high concentrations, they would not be associated with health effects in the low levels observed in these samples. They are, however, associated with powerful, pungent, acrid odors.

In summary, elevated hydrogen sulfide levels occurred at the River Street location on the night before and on one night after the aerators began operating in the active Charbert lagoon. Elevated hydrogen sulfide levels were not present on subsequent nights, despite the presence of stagnant wind conditions and southerly winds during that period. A VOC sample collected on the afternoon of July 30<sup>th</sup>, when an odor that appeared to originate at the lagoons was present in the neighborhood, contained background concentrations of the target VOCs and low levels of three aldehyde compounds. Low levels of those aldehydes are not associated with health effects but are associated with pungent odors.

Table I, below shows the maximum 15-minute, one-hour and 24-hour average hydrogen sulfide concentrations measured by the River Street monitor during the most recent and previous monitoring periods and the concentrations measured previously at a site on Woodville-Alton Road that has since been discontinued.

Table I Maximum Hydrogen Sulfide Levels

| Monitor            | Date           | Maximum 15-minute Level | Maximum 1-hour Level<br><br>Nuisance Air Quality<br>>2 - <100 ppb<br><br>Moderate Air Quality<br>100 - <1000 ppb | Maximum 24-hour Level<br><br>Nuisance Air Quality<br>>2 - < 30 ppb<br><br>Moderate Air Quality<br>30 - <70 ppb |
|--------------------|----------------|-------------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| River Street       | 6/7– 6/14/04   | 78 ppb                  | 49 ppb                                                                                                           | 7 ppb                                                                                                          |
|                    | 6/15 – 6/21/04 | 44 ppb                  | 29 ppb                                                                                                           | 7 ppb                                                                                                          |
|                    | 6/21 – 6/28/04 | 90 ppb*                 | 79 ppb*                                                                                                          | 15 ppb                                                                                                         |
|                    | 6/28 – 7/7/04  | 90 ppb*                 | 78 ppb*                                                                                                          | 16 ppb                                                                                                         |
|                    | 7/7 – 7/12/04  | 45 ppb                  | 33 ppb                                                                                                           | 7 ppb                                                                                                          |
|                    | 7/16 – 7/26/04 | 90 ppb*                 | 86 ppb*                                                                                                          | 16 ppb                                                                                                         |
|                    | 7/27 – 8/04/04 | 29 ppb                  | 23 ppb                                                                                                           | 3 ppb                                                                                                          |
| Woodville-Alton Rd | 5/13 – 6/7/04  | 6 ppb                   | 2 ppb                                                                                                            | 0.2 ppb                                                                                                        |
|                    | 6/6 – 6/14/04  | 27 ppb                  | 19 ppb                                                                                                           | 3 ppb                                                                                                          |
|                    | 6/15 – 6/21/04 | 10 ppb                  | 5 ppb                                                                                                            | 1 ppb                                                                                                          |
|                    | 6/22 – 6/28/04 | 16 ppb                  | 13 ppb                                                                                                           | 2 ppb                                                                                                          |
|                    | 6/28 – 7/7/04  | 39 ppb                  | 28 ppb                                                                                                           | 2 ppb                                                                                                          |
|                    | 7/7 – 7/15/04  | 12 ppb                  | 7 ppb                                                                                                            | 1 ppb                                                                                                          |

\*Due to the limitations of the instrumentation, concentrations during these periods may have been higher than these values.

The hydrogen sulfide concentrations recorded during the two days during the July 27 – August 4 period when elevated levels were recorded are in the range of values classified as nuisance levels by the Rhode Island Department of Health (HEALTH). These levels could cause a rotten-egg type odor. HEALTH warns that people exposed to nuisance levels of hydrogen sulfide may experience nausea and stress from the odors, an increase in non-specific symptoms and a possible exacerbation of chronic respiratory symptoms in hypersensitive individuals.

Hydrogen sulfide monitoring is continuing at the River Street location. For more information about sampling results, contact Barbara Morin at 222-4700, ext. 7012.

| <b>Appendix A</b>           | <b>South End</b> | <b>South End</b>  | <b>16 River St.</b> |                  |                  |
|-----------------------------|------------------|-------------------|---------------------|------------------|------------------|
| <b>Charbert VOC samples</b> | <b>River St.</b> | <b>Myrtle St.</b> |                     | <b>Cancer</b>    | <b>Noncancer</b> |
|                             | <b>6/24/2004</b> | <b>6/24/2004</b>  | <b>07/30/04</b>     | <b>1/million</b> | <b>Benchmark</b> |
| <b><u>Name</u></b>          | <b>ppb</b>       | <b>ppb</b>        | <b>ppb</b>          | <b>ppb</b>       | <b>ppb</b>       |
| ethylene                    | 1.10             | 0.98              | 0.30                |                  |                  |
| acetylene                   | 0.94             | 2.42              | 0.32                |                  |                  |
| ethane                      | 2.06             | 2.12              | 2.56                |                  |                  |
| propene                     | 0.24             | 0.21              | 0.17                |                  | 2000             |
| propane                     | 3.71             | 3.27              | 0.96                |                  |                  |
| chloromethane               | 0.73             | 0.67              | 0.59                |                  | 40               |
| isobutane                   | 0.30             | 0.29              | 0.09                |                  |                  |
| 1-butene                    | 0.14             | 0.12              | 0.15                |                  |                  |
| 1,3-butadiene               | 0.02             | 0.03              | 0.01                | 0.01             | 2                |
| butane                      | 0.56             | 0.52              | 0.13                |                  |                  |
| acetonitrile                | 0.04             | 0.00              | 0.14                |                  | 40               |
| acetone                     | 9.36             | 0.85              | 6.71                |                  | 10000            |
| isopentane                  | 1.17             | 1.02              | 0.04                |                  |                  |
| pentane                     | 0.41             | 0.43              | 0.10                |                  |                  |
| carbon disulfide            | 0.02             | 0.01              | 0.005               |                  | 200              |
| Methyl-t-butyl-ether        | 0.58             | 0.63              | 0.05                |                  | 800              |
| 2-methylpentane             | 0.33             | 0.29              | 0.04                |                  |                  |
| methyl ethyl ketone         | 0.39             | 0.04              | 0.38                |                  | 300              |
| 3-methylpentane             | 0.22             | 0.17              | 0.01                |                  |                  |
| n-hexane                    | 0.23             | 0.20              | 0.000               |                  | 60               |
| 1,1,1-trichloroethane       | 0.02             | 0.02              | 0.003               |                  | 200              |
| benzene                     | 0.22             | 0.19              | 0.05                | 0.04             | 9                |
| carbon tetrachloride        | 0.12             | 0.09              | 0.09                | 0.01             | 6                |
| n-heptane                   | 0.07             | 0.07              | 0.00                |                  |                  |
| toluene                     | 0.67             | 0.66              | 0.04                |                  | 100              |
| ethylbenzene                | 0.09             | 0.11              | 0.00                |                  | 200              |
| p & m xylenes               | 0.24             | 0.28              | 0.008               |                  | 20               |
| o-xylene                    | 0.10             | 0.10              | 0.00                |                  | 20               |
| a-pinene                    | 0.92             | 0.96              | 0.04                |                  |                  |
| 1,2,4-trimethylbenzene      | 0.09             | 0.10              | 0.02                |                  |                  |
| trans-2-butene              | 0.05             | 0.04              | 0.01                |                  |                  |
| cis-2-butene                | 0.05             | 0.05              | 0.008               |                  |                  |
| 1-pentene                   | 0.05             | 0.05              | 0.05                |                  |                  |
| isoprene                    | 0.34             | 0.55              | 4.59                |                  |                  |
| trans-2-pentene             | 0.07             | 0.10              | 0.00                |                  |                  |
| cis-2-pentene               | 0.03             | 0.05              | 0.00                |                  |                  |
| dichloromethane             | 0.11             | 0.09              | 0.05                | 0.60             | 100              |
| 2,2-dimethylbutane          | 0.04             | 0.05              | 0.00                |                  |                  |
| cyclopentane                | 0.04             | 0.04              | 0.00                |                  |                  |
| 2,3-dimethylbutane          | 0.11             | 0.12              | 0.00                |                  |                  |
| chloroform                  | 0.04             | 0.04              | 0.00                | 0.01             | 60               |
| methylcyclopentane          | 0.14             | 0.12              | 0.00                |                  |                  |
| 2,4-dimethylpentane         | 0.05             | 0.04              | 0.00                |                  |                  |
| cyclohexane                 | 0.05             | 0.05              | 0.00                |                  |                  |
| 2-methylhexane              | 0.10             | 0.09              | 0.00                |                  |                  |
| 2,3-dimethylpentane         | 0.06             | 0.06              | 0.00                |                  |                  |
| 3-methylhexane              | 0.11             | 0.10              | 0.00                |                  |                  |

| <b>Appendix A</b>                                                | <b>South End</b> | <b>South End</b>  | <b>16 River St.</b> |                  |                  |
|------------------------------------------------------------------|------------------|-------------------|---------------------|------------------|------------------|
| <b>Charbert VOC samples</b>                                      | <b>River St.</b> | <b>Myrtle St.</b> |                     | <b>Cancer</b>    | <b>Noncancer</b> |
| trichloroethylene                                                | 0.003            | 0.000             | 0.000               | 0.09             | 100              |
|                                                                  | <b>South End</b> | <b>South End</b>  |                     |                  |                  |
| <b>Charbert samples</b>                                          | <b>River St.</b> | <b>Myrtle St.</b> |                     | <b>Cancer</b>    | <b>Noncancer</b> |
|                                                                  | <b>6/24/2004</b> | <b>6/24/2004</b>  |                     | <b>1/million</b> | <b>Benchmark</b> |
| <u>Name</u>                                                      | <b>ppb</b>       | <b>ppb</b>        |                     | <b>ppb</b>       | <b>ppb</b>       |
| 2,2,4-trimethylpentane                                           | 0.16             | 0.15              | 0.01                |                  | 200              |
| methylcyclohexane                                                | 0.06             | 0.05              | 0.00                |                  |                  |
| 2,3,4-trimethylpentane                                           | 0.05             | 0.05              | 0.00                |                  |                  |
| 2-methylheptane                                                  | 0.03             | 0.02              | 0.00                |                  |                  |
| 3-methylheptane                                                  | 0.03             | 0.02              | 0.00                |                  |                  |
| n-octane                                                         | 0.04             | 0.03              | 0.00                |                  |                  |
| tetrachloroethylene                                              | 0.04             | 0.03              | 0.00                | 0.03             | 5                |
| styrene                                                          | 0.01             | 0.02              | 0.00                |                  | 200              |
| n-nonane                                                         | 0.03             | 0.02              | 0.00                |                  |                  |
| isopropylbenzene                                                 | 0.009            | 0.009             | 0.00                |                  |                  |
| n-propylbenzene                                                  | 0.02             | 0.03              | 0.00                |                  |                  |
| m-ethyltoluene                                                   | 0.06             | 0.06              | 0.002               |                  |                  |
| p-ethyltoluene                                                   | 0.04             | 0.04              | 0.00                |                  |                  |
| 1,3,5-trimethylbenzene                                           | 0.02             | 0.02              | 0.00                |                  |                  |
| o-ethyltoluene                                                   | 0.03             | 0.03              | 0.00                |                  |                  |
| n-decane                                                         | 0.03             | 0.02              | 0.00                |                  |                  |
| p-dichlorobenzene                                                | 0.01             | 0.008             | 0.00                | 0.02             | 100              |
| 1,2,3-trimethylbenzene                                           | 0.02             | 0.02              | 0.00                |                  |                  |
| m-diethylbenzene                                                 | 0.004            | 0.000             | 0.00                |                  |                  |
| p-diethylbenzene                                                 | 0.01             | 0.02              | 0.00                |                  |                  |
| n-undecane                                                       | 0.03             | 0.03              | 0.02                |                  |                  |
| dodecane                                                         | 0.03             | 0.03              | 0.02                |                  |                  |
| vinyl chloride                                                   | 0.000            | 0.000             | 0.000               | 0.09             | 40               |
| acrylonitrile                                                    | 0.000            | 0.000             | 0.00                | 0.005            | 0.9              |
| 1,1-dichloroethene                                               | 0.000            | 0.000             | 0.00                | 0.005            | 50               |
| 1,1-dichloroethane                                               | 0.000            | 0.000             | 0.00                | 0.16             |                  |
| ethyl acetate                                                    | 0.000            | 0.000             | 0.00                |                  |                  |
| 1,2-dichloroethane                                               | 0.000            | 0.000             | 0.00                | 0.01             | 100              |
| 1,2-dichloropropane                                              | 0.000            | 0.000             | 0.00                | 0.02             | 0.9              |
| cis-1,3-dichloropropene                                          | 0.000            | 0.000             | 0.00                | 0.04             | 4                |
| trans-1,3-dichloropropene                                        | 0.000            | 0.000             | 0.00                | 0.04             | 4                |
| 1,2-dibromoethane                                                | 0.000            | 0.000             | 0.00                | 0.00065          | 0.8              |
| chlorobenzene                                                    | 0.000            | 0.000             | 0.00                |                  | 200              |
| 1,1,2,2-tetrachloroethane                                        | 0.000            | 0.000             | 0.00                | 0.003            | 400              |
| TNMOC ppbC                                                       | 156              | 134               | 103                 |                  |                  |
| *Note: Total NonMethane Organic Compounds (TNMOC) is in units of |                  |                   |                     |                  |                  |
| parts per billion carbon (ppbC)                                  |                  |                   |                     |                  |                  |
|                                                                  |                  |                   |                     |                  |                  |